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An integrated framework for risk assessment of invasive urban ants

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Accurate forecasting of biological invasions is extremely difficult especially given the trends of increasing global commerce, transportation and travel. Invasive ants are among the worst invaders worldwide due to their negative impacts, and the magnitude of impacts is expected to be more profound in human-altered areas (ex. urban or agricultural settings) presumably as a result of pre-adaptation to such environments. Risk assessment analysis (RAA) represents one of few reliable approaches that effectively assist in preventing introductions of invasive species including ants. We developed an integrated framework that focuses on "likelihood of entry", one of the critical elements of RAA, using population genetic data along with trade records. We hypothesized that the volume of international trade can serve as a predictor of propagule pressure of invasive ants, which generally transforms into the invasion success. Our genetic data coincide with intensity of trade where the most likely source population of invasive ants determined genetically appears to be at or near areas that rank highest in exportation of goods to a recipient country. Such patterns provide support for tight linkage of introduction routes and invasion success to global trade and transportation networks. Integration of population genetic data and trade estimates into future RAA may assist in establishing early warning systems as well as identifying routes of risk that potentially introduce invasive ants.